

REMARKS

This Preliminary Amendment cancels without prejudice original claims 1 to 8 in the underlying PCT Application No. PCT/DE03/02234, and adds new claims 9 to 16. The new claims, *inter alia*, conform the claims to United States Patent and Trademark Office rules and do not add new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract, but without claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/DE03/02234, includes an International Search Report, dated October 27, 2003, a copy of which is included. The Search Report includes a list of documents that were uncovered by the Examiner in the underlying PCT application. A copy of the Search Report accompanies this Preliminary Amendment.

It is respectfully submitted that the present invention is new, non-obvious, and useful. Prompt consideration and allowance of the claims are respectfully requested.


Respectfully Submitted,
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[10191/3499]

ELECTRICAL CONTACTING OF THIN ENAMELED WIRES OF SECONDARY
WINDINGS OF IGNITION COILSFIELD OF THE INVENTION

The present invention relates to an electrical connection set-up for manufacturing an ignition coil, particularly a rod-type ignition coil having an ignition coil rod with a high-voltage outlet.

~~Background Information~~ BACKGROUND INFORMATION

Ignition coils may produce a high-voltage ~~sparks~~. ~~This spark sparks, which jumps jump~~ between the electrodes of the spark plug set up at the ignition coil, thus igniting the air-gasoline mixture of an internal combustion engine, for example. ~~Normally, this~~ This spark plug ~~is~~ may be supplied with high voltage from an ignition coil. A primary winding and a corresponding secondary winding ~~are~~ may be provided within the ignition coil. At one end, the primary winding ~~is~~ may be connected to an ignition switch, while its other end ~~is~~ may be connected to a so-called contact breaker.

The secondary winding, that is, the winding responsible for generating the ignition spark, ~~is~~ may be connected in the interior of the ignition coil to the one end of the primary winding, so that it is grounded. The other end of the secondary winding ~~is~~ may be connected to the high-voltage outlet, which in turn ~~is~~ may be either connected to an ignition cable leading to the spark plug, or at which the spark plug is set up directly.

The secondary winding itself ~~is~~ may be made of a thin wire coated with a suitable layer of enamel so as to avoid the contacting of the individual wires when wrapping a specific

support part or coil shell. After the secondary windings have been wound onto a shell, the ends of the respective wires are contacted. ~~Normally, thermal~~ Thermal contacting methods such as soldering or welding, for example, ~~are known~~ may be used for this purpose.

~~Disadvantages of the Related Art~~

Different work processes are may be required especially, such as, for example, with regard to contacting the primary and secondary windings. This ~~entails~~ may entail higher installation costs, multiple assembly steps and also a certain number of connecting parts ~~necessary~~ required to make an appropriate electrical connection.

Furthermore, in ~~such~~ a tight installation space, it ~~was often~~ may be difficult to bring about an appropriate contacting using ~~the known~~ conventional thermal methods.

~~Object of the Invention~~ SUMMARY OF THE INVENTION

The ~~object of the~~ present invention ~~is to~~ may provide a connection set-up between an ignition coil rod of an ignition coil and a secondary or primary winding which is inexpensive and readily implemented.

~~Achievement of the Objective~~

The ~~basic principle for achieving the objective is to~~ replace the According to an exemplary embodiment of the present invention, the conventional thermal contacting method ~~known per se from the related art. This is achieved~~ may be replaced by providing additional contacting elements that break through

~~the insulation of~~ the enamel-coated wire of the secondary winding during installation, thus bringing about an appropriate contacting.

5 ~~Summary of the Invention~~

In particular, it may be seen as an ~~advantage~~ desirable for the electrical connection set-up for producing an ignition coil, that the contacting ~~according to the present invention~~
10 ~~is~~ be integrated into already existing components, and may be reliably produced using simple processes.

Compared to the ~~previous~~ conventional method, ~~the a~~ "cold" contacting method proposed here ~~has the advantage that it~~
15 ~~involves~~ may involve no additional installation costs. In addition, the set-up of the present invention ~~makes it possible to~~ may reduce the number of assembly steps and the number of connecting parts.

20 ~~A further substantial advantage~~ According to an exemplary embodiment of the present invention ~~is that,~~ the implementation of the contacting does not require optimization of the installation space. ~~This means that~~ Thus, it ~~is~~ may not be necessary to reserve a free space in the area of
25 contacting, e.g. for electrode holders, soldering irons or the like.

Simply by sliding a contact sleeve onto the coil shell configured as a secondary winding, this contacting body may be
30 slid directly onto the coil shell without shifting the installed secondary winding. This ~~is~~ may be achieved by the ~~fact~~ feature that the contact sleeve is slit lengthwise and may thus be opened up as a spring.

This contact sleeve ~~features~~ may feature contact clips on its outer surface, which, after the contact sleeve has been slid onto the coil shell, contact the wire of the secondary winding due to their spring-like form in that the contact clip of the contact sleeve breaks through the insulation, for example, of an enamel coating of the wires of the secondary winding.

The contact sleeve ~~is to~~ may be guided over the coil shell until it strikes against a stop formed on an ignition coil rod. To prevent damaging or shifting the secondary wire, the diameter of the contact sleeve ~~is~~ may be larger or at least equal to the diameter of the secondary shell and twice as large as the diameter of the wire. As soon as the contact sleeve is positioned in a very straightforward manner in the contacting area of the ignition coil rod, it ~~is~~ may be installed in the ignition coil housing with the high-voltage outlet. By insertion into a cup-shaped formation, the contact clips are pressed onto the winding of the secondary winding, thus breaking through the insulating layer of the wire and establishing a permanent electrical contact. The free end of the winding of the secondary wire ~~is preferably~~ may be wound around a pin-like formation at the end of the ignition coil rod. This pin is then inserted into the high-voltage outlet. This ~~prevents~~ may prevent failures of the ignition coil due to superelevations of the field at the end of the wire.

A space-saving alternative ~~provides~~ may provide for rupture joints on the pin-like formation of the ignition coil rod. ~~This has the effect so~~ so that, when the assembly is installed into the ignition coil housing, the pin on the side of the high-voltage outlet breaks, and specifically inwardly ~~in such a way~~ so that contact is ensured in spite of the break.

~~Further advantageous embodiments will become apparent from the following description as well as the drawings and the claims.~~

5 ~~Brief Description of the Drawing~~ BRIEF DESCRIPTION OF THE DRAWINGS

~~The figures show:~~

10 ~~Fig. 1 A~~ Fig. 1 shows a perspective view of an ignition coil
having one side for the high-voltage outlet and another side
for the low-voltage outlet~~7.~~

15 Fig. 2 A shows a sectional view through the ignition coil
according to Fig. 1~~7.~~

Fig. 3 An shows an enlarged representation of the perspective
view of the side of the high-voltage outlet of the ignition
coil rod~~7.~~

20 Fig. 4 A shows a section through the enlarged view of the side
of the high-voltage outlet according to Fig. 3~~7.~~

Fig. 5 A shows a perspective view of the contact sleeve for
25 installation on the side of the high-voltage outlet~~7.~~

Fig. 6 A shows a sectional view of the contact sleeve
according to Fig. 5~~7.~~

30 Fig. 7 An shows an enlarged partial representation of the
contact clips of the contact sleeve according to an example
embodiment of the present invention according to Fig. 6.

~~Description of an Exemplary Embodiment~~ DETAILED DESCRIPTION

Fig. 1 shows a perspective view of an ignition coil 1.

Ignition coil 1 includes an ignition coil housing 2 and an ignition coil rod 3 located in ignition coil housing 2. In addition, ignition coil 1 features a side for a high-voltage outlet H and a side for the low-voltage outlet N. The side of low-voltage outlet N is provided to establish contact with a power supply not detailed in the drawing, while the side of high-voltage outlet H is provided for connecting to an ignition cable or a spark plug not detailed in the drawing.

Fig. 2 shows a sectional view of ignition coil 1 represented in Fig. 1, the areas shown relating to essential features of the invention represented in more detail in the subsequent figures.

On high-voltage side H, a contacting area 20 (Fig. 3) is provided on ignition coil rod 3, which provides for the installation of a secondary winding 22 on a coil shell 21. Following the completion of the winding of secondary wire 22, it is guided through a bore hole 23 into contacting area 20, where it is further wound until it enters a groove 24 and reaches a pin 25. At pin 25, the free end of secondary wire 22 is tied up.

A contact sleeve 26 depicted in Fig. 4 through 7 is now put over contacting area 20. This contact sleeve 26 has at least one axial slit 27, which preferably, for example, does not extend over the entire length. In addition, provided on the peripheral surface of contact sleeve 26 is at least one contact clip 28 for establishing a contact with secondary winding 22 in contacting area 20 on the side of high-voltage outlet H.

By virtue of axial slit 27, contact sleeve 26 is now guided over contacting area 20 of ignition coil rod 3 on the side of high-voltage outlet H until it reaches a stop 29. The

5 expansion of contact sleeve 26 while sliding it on prevents secondary winding 22 on the side of high-voltage outlet H from being damaged ~~in any way~~. Contact sleeve 26 is ~~designed in such a way~~ configured so that it reaches a press fit immediately after it has been slid over the contacting area,
10 preventing contact sleeve 26 from falling off again.

As shown in Fig. 4, this assembly made up of ignition coil rod 3 and contact sleeve 26 is now installed into high-voltage outlet H of ignition coil housing 2. Ignition coil housing 2
15 features a cup-shaped formation 30 for receiving the free end of ignition coil rod 3. In addition, a recess 31 is provided for receiving pin 25 of ignition coil rod 3.

Due to cup-shaped formation 30 of ignition coil housing 2,
20 contact clips 28 of contact sleeve 26 are pressed in a defined manner in the direction of an arrow 32 (Fig. 4). The insulating layer of secondary wire 22 is thereby pierced and an electrical contact permanently established. The free end of secondary wire 22, which is wound around pin 25, is inserted
25 into recess 31. At the same time, stop 29, located on the side of ignition coil rod 3, rests on a shoulder 33 on the side of ignition coil housing 2. By integrating the contacting option and existing components, ~~it has become possible to create~~ contacting options may be created between components and the
30 secondary winding in an ignition coil via simple joining operations, while saving additional installation costs, assembly steps and the like.

~~Abstract~~ ABSTRACT

~~The present invention relates to an~~ An electrical connection set-up for manufacturing an ignition coil, ~~which is~~ is provided, ~~to replace current contacting methods e.g.,~~ for
5 connecting thin enameled wires in ignition coils ~~such as thermal methods, for example.~~ In this regard ~~The objective of the present invention is achieved in that,~~ on the side of the high-voltage outlet ~~(H)~~, a contacting sleeve ~~(26)~~ is provided which is installed by being lifted over a corresponding
10 secondary winding without making contact and which then snaps into place due to the spring-like form or mounting, while elements provided on the contacting sleeve ~~(26)~~ break through an insulating layer surrounding the secondary winding, thus establishing the electrical connection without the use of
15 thermal methods.

~~(Fig. 3)~~